CLAIMS:

[C001] 1. A method for determining a position of a moving platform, the method comprising:

transmitting a carrier signal from one of the moving platform and a stationary platform;

receiving a received signal at the other of the moving and stationary platforms;

deriving a frequency shift between the carrier signal and the received signal; and

calculating the apparent closing velocity using the frequency shift and a frequency of the carrier signal.

[C002] 2. The method of claim 1, wherein determining the position of the moving platform comprises monitoring the closing velocity over a period of time.

[C003] 3. The method of claim 1, wherein calculating the apparent closing velocity comprises using the equation:

$$f_d(t) = \frac{f_c\, v_c(t)}{c} + f_m + n(t)$$

wherein $f_d(t)$ represents the frequency shift, f_c represents a center frequency of the carrier signal, c represents a speed of radio propagation, f_m is a constant frequency offset between local oscillators at the transmitter and the receiver system, n(t) represents a measurement noise and $v_c(t)$ represents the apparent closing velocity.

[C004] 4. The method of claim 3, wherein the apparent closing velocity is characterized by a measured shape described by $\cos(\theta(z))$, wherein z represents the distance that the moving platform has traveled and θ represents a location-varying angle.

[C005] 5. The method of claim 4, further comprising determining a course of the moving platform by comparing the measured shape to a plurality of stored shapes.

[C006] 6. The method of claim 5, wherein the comparing comprises using sequential statistical methods.

[C007] 7. The method of claim 1, wherein deriving the frequency shift comprises analyzing a frequency spectrum corresponding to the received signal.

[C008] 8. The method of claim 1, wherein deriving the frequency shift comprises generating a spread spectrum of the received signal.

[C009] 9. The method of claim 8, wherein generating a spread spectrum further comprises generating a spectral line at twice the frequency of a Doppler shift of the received signal.

[C010] 10. The method of claim 9, wherein the Doppler shift is determined using a center frequency of the received signal.

[C011] 11. The method of claim 10, wherein the center frequency of the received signal is determined by homodyning the spread spectrum of the received signal.

[C012] 12. The method of claim 1, wherein the stationary platform comprises a plurality of stationary platforms.

[C013] 13. The method of claim 1, wherein the stationary platform comprises a transmitter coupled to a railway track.

[C014] 14. The method of claim 12, wherein the transmitter is coupled to a turnout on the railway track.

[C015] 15. The method of claim 1, wherein the stationary platform comprises a mobile communication platform base station.

[C016] 16. The method of claim 1, wherein the stationary platform comprises a broadcast station.

[C017] 17. The method of claim 1, wherein the stationary platform comprises a cellular network station.

[C018] 18. The method of claim 1, wherein the moving platform is a locomotive.

[C019] 19. The method of claim 1, wherein the carrier signal comprises radio frequency signals.

[C020] 20. A system for determining a position of a moving platform, the system comprising:

a transmitter configured for transmitting a carrier signal from one of the moving platform and a stationary platform;

a receiver system configured for receiving a received signal from the other of the moving and stationary platforms, the receiver system further comprising:

a processor configured for:

(i) deriving a frequency shift between the carrier signal and the received signal;

(ii) calculating the apparent closing velocity angle using the frequency shift and a frequency of the carrier signal.

[C021] 21. The system of claim 20, wherein the processor is further configured for determining the position of the moving platform by monitoring the apparent closing velocity over a period of time.

[C022] 22. The system of claim 20, wherein the processor is configured for deriving the apparent closing velocity using the equation:

$$f_d(t) = \frac{f_c\, v_c(t)}{c} + f_m + n(t)$$

wherein $f_d(t)$ represents the frequency shift, f_c represents a center frequency of the carrier signal, c represents a speed of radio propagation, f_m is a constant frequency

offset between local oscillators at the transmitter and at the receiver system, n(t) represents a measurement noise and $v_c(t)$ represents the apparent closing velocity.

[C023] 23. The system of claim 20, wherein the processor is further configured to characterize the apparent closing velocity by a measured shape described by $\cos(\theta(z))$, wherein z represents the distance that the moving platform has traveled and θ represents a location-varying angle.

[C024] 24. The system of claim 23, wherein the processor is further configured for determining a course of the moving platform by comparing the measured shape to a plurality of stored shapes.

[C025] 25. The system of claim 24, wherein processor is configured for comparing the measured shape to a plurality of stored shapes using sequential statistical methods.

[C026] 26. The system of claim 20, wherein the transmitter is coupled to the stationary platform and the processor is configured to derive the frequency shift by analyzing a frequency spectrum of the received signal.

[C027] 27. The system of claim 20, wherein the processor is configured for the deriving the frequency shift by generating a spread spectrum of the received signal.

[C028] 28. The system of claim 27, wherein the processor further comprises a spread spectrum system configured for generating a spectral line at twice the frequency of a Doppler shift of the received signal.

[C029] 29. The system of claim 28, wherein the Doppler shift is determined using a center frequency of the received signal.

[C030] 30. The system of claim 29, wherein the center frequency of the received signal is determined by homodyning the spread spectrum of the received signal.

[C031] 31. The system of claim 20, wherein the carrier signal comprises radio frequency signals.

[C032] 32. The system of claim 20, wherein the stationary platform comprises a plurality of stationary platforms.

[C033] 33. The system of claim 20, wherein the stationary platform comprises a transmitter coupled to a railway track.

[C034] 34. The system of claim 33, wherein the transmitter is coupled to a turnout on the railway track.

[C035] 35. The system of claim 20, wherein the stationary platform comprises a mobile communication platform base station.

[C036] 36. The system of claim 20, wherein the stationary platform comprises a broadband station.

[C037] 37. The system of claim 20, wherein the stationary platform comprises a cellular network base station.

[C038] 38. The system of claim 20, wherein the moving platform comprises a locomotive.

[C039] 39. The system of claim 20, wherein the receiver system is coupled to the moving platform.

[C040] 40. The system of claim 20, wherein the receiver system is coupled to the stationary platform.

[C041] 41. A system for determining a position of a moving platform , the system comprising:

means for transmitting a carrier signal from one of the moving platform and a stationary platform;

means for receiving a received signal at the other of the moving and stationary platforms;

means for deriving a frequency shift between the carrier signal and the received signal;

means for calculating the apparent closing velocity using the frequency shift, a frequency of the carrier signal.

[C042] 42. The system of claim 41, determining the position of the moving platform further comprises means for monitoring the apparent closing velocity over a period of time.

[C043] 43. The method of claim 41, wherein the means for calculating the apparent closing velocity shift comprising using the equation:

$$f_d(t) = \frac{f_c\, v_c(t)}{c} + f_m + n(t)$$

wherein $f_d(t)$ represents the frequency shift, f_c represents a center frequency of the carrier signal, c represents a speed of radio propagation, f_m is a constant frequency offset between local oscillators at the transmitter and at the receiver system, n(t) represents a measurement noise and $v_c(t)$ represents the apparent closing velocity.

[C044] 44. The system of claim 43, wherein the means for calculating the apparent closing velocity comprises means for characterizing the apparent closing velocity by a measured shape described by $\cos(\theta(z))$, wherein z represents the distance that the moving platform has traveled and θ represents a location-varying angle.

[C045] 45. The system of claim 44, further comprising means for determining a course of the moving platform by comparing the measured shape to a plurality of stored shapes.

[C046] 46. The system of claim 41, wherein the means for deriving the frequency shift comprises means for analyzing a frequency spectrum corresponding to the received signal.

[C047] 47. The system of claim 41, wherein the means for deriving the frequency shift comprises means for generating a spread spectrum of the received signal.

[C048] 48. The system of claim 47, wherein the means for generating the spread spectrum further comprises means for generating a spectral line at twice the frequency of a Doppler shift of the received signal.

[C049] 49. A system for determining a position of a moving platform, the system comprising:

a transmitter configured for transmitting a modulated carrier signal;

a receiver system configured for demodulating a received carrier signal, the receiver system further comprising a processor configured for

deriving a frequency shift between the carrier signal and the received signal,

calculating an apparent closing velocity using the frequency shift of the received signal relative to a center frequency of the transmitted carrier signal, and

estimating the position of the moving platform by monitoring the apparent closing velocity over a period of time.

[C050] 50. The system of claim 49, wherein the processor is configured for calculating the apparent closing velocity using the equation:

$$f_d(t) = \frac{f_c\, v_c(t)}{c} + f_m + n(t)$$

wherein $f_d(t)$ represents the frequency shift, f_c represents a center frequency of the carrier signal, c represents a speed of radio propagation, f_m is a constant frequency offset between local oscillators at the transmitter and at the receiver system, n(t) represents a measurement noise and $v_c(t)$ represents the apparent closing velocity.

[C051] 51. The system of claim 50, wherein the processor is further configured to characterize the apparent closing velocity by a measured shape described by $\cos(\theta(z))$, wherein z represents the distance that the moving platform has traveled and θ represents a location-varying angle.

[C052] 52. The system of claim 51, wherein the processor is further configured for determining a course of the moving platform by comparing the measured shape to a plurality of stored shapes.

[C053] 53. The system of claim 52, wherein processor is configured for comparing the measured shape to a plurality of stored shapes using sequential statistical methods.

[C054] 54. The system of claim 49, wherein the transmitter is coupled to the stationary platform and the processor is configured to derive the frequency shift by analyzing a frequency spectrum of the received signal.

[C055] 55. The system of claim 49, wherein the processor is configured for the deriving the frequency shift by generating a spread spectrum of the received signal.

[C056] 56. The system of claim 55, wherein the processor further comprises a spread spectrum system configured for generating a spectral line at twice the frequency of a Doppler shift of the received signal.

[C057] 57. The system of claim 56, wherein the processor is further configured for determining the Doppler shift by using a center frequency of the received signal.

[C058] 58. The system of claim 57, wherein the center frequency of the received signal is determined by homodyning the spread spectrum of the received signal.

[C059] 59. The system of claim 49, wherein the moving platform is a locomotive.

[C060] 60. The system of claim 59, wherein the stationary platform comprises a plurality of stationary platforms.